

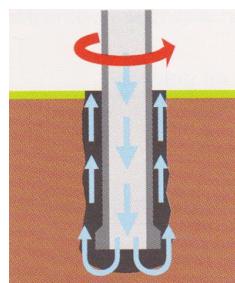


**Vertical drilling is performed for a variety of purposes, such as geotechnical or geological surveys, environmental studies, water extraction, cold/heat storage, installing vertical soil heat exchangers, installing freezing tubes, drilling degassing wells and installing permanent dewatering systems. A variety of methods are used.**



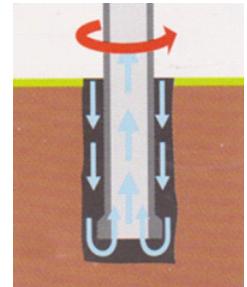
## Jet drilling

Jet drilling is used very extensively. Drill stems are bored into the ground by a drilling machine. Water pumped through the stems transports the spoil past the outside of the drill stem to the surface, where it is captured. This is a simple drilling method with no depth restrictions. However, there are restrictions on the diameter of the borehole (up to approximately 500 mm), and there must be sufficient positive pressure to ensure the stability of the borehole. This method is used to drill wells for dewatering and water extraction, sampling wells, return dewatering wells, and deep geological exploration.



## Suction drilling

This method also involves a drill stem bored into the ground by a drilling machine, but it differs from jet drilling in that the drilling fluid flows downward through the borehole and the spoil is sucked up through the drill stem by a self-priming pump. The water is recovered in a sedimentation basin. The diameter of the borehole is more uniform with this method than with jet drilling. Larger diameters are also possible. However, the drilling rate speed is limited with suction drilling and the depth is limited to approximately 150 m. Sufficient positive pressure must also be present. Suction drilling is used to drill wells in coarse fractions and for large-diameter boreholes.

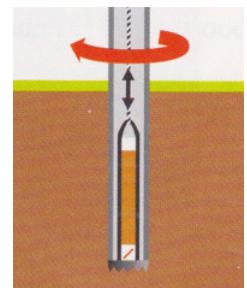


## Airlift drilling

As with suction drilling, the spoil is transported to the surface through the drill stem by the circulating drilling fluid. Unlike suction drilling, with airlift drilling the circulation results from injecting air into the drill stem at a certain depth. The injected air causes the density of the drilling fluid inside the drill stem to be less than the density of the fluid outside the stem, resulting in an upward flow inside the drill stem.

## Pulse tube drilling

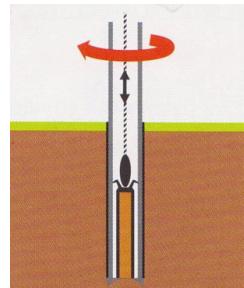
A drill stem is bored into the ground with the aid of a turntable. A pulse tube (a short tube with a check valve at the bottom that can only open inwards) is dropped into the drill stem through a hatch or propelled by a rod, causing a mixture of soil and groundwater to flow into the grab. The pulse tube is filled by allowing it to drop several times, after which the disturbed sample can be pulled up. This simple drilling method is used primarily below groundwater level and in loose subsoils.





### Core drilling

This is a rotating cased drilling method. The outer drill stem is fitted with a drilling head. A separate, stationary coring tube inside the drill stem captures the samples. The samples are removed using the wire-line system. This method is used in rock formations or clay strata. It is less suitable for loose formations.



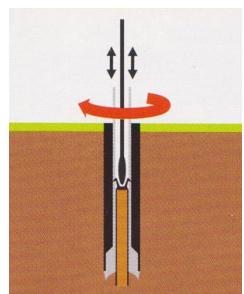
### Sampling tube drilling

A sampling tube is a hollow tube with a removable wall that is driven into the ground by a falling weight. As with percussion drilling, this is done inside a drill stem that has been bored into the ground by a turntable. The soil samples are mixed less than with percussion drilling, and this method is used in virtually all types of ground above groundwater level. If there is too much friction to allow the drill stem to reach the desired depth, a second, smaller-diameter stem can be inserted through the first stem to allow samples from greater depths to be obtained with the sampling tube.



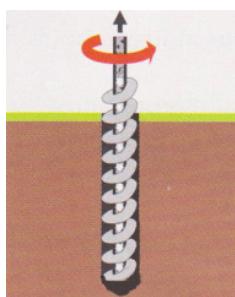
### Push-tube drilling

This continuous pushing system for obtaining undisturbed samples is used in loose formations such as sand, and in clay. The sampling tube is pressed into the ground, for example by drill rods, and then drilled free using the same rods. This method gives better samples in loose formations under all conditions, but it is not suitable for relatively hard subsoils or for obtaining undisturbed samples from stony formations.



### Auger drilling

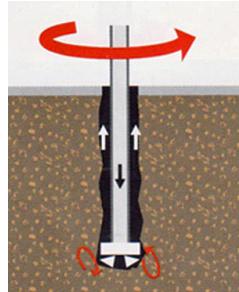
An auger drill or spiral drill is rotating fluted drill. The rotary motion causes the drill to screw into the ground. Hollow auger drills can also be used. In this case the auger flutes are attached on the outside of a tube. The hollow stem allows another device, such as a sampling tube, to be inserted. The advantages of this method are fast, economical execution (no water necessary), minimal soil disturbance, and freedom from shock and vibration.





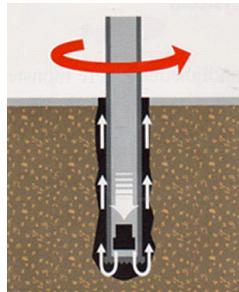
## Roller-bit drilling

A roller bit can be used for drilling in rock formations using the jet drilling method. The roller bit has three conical cutters with milled teeth. The hardness and wear resistance are sufficient for drilling in stone. The spoil is transported back to the surface along the outside of the drill stem by water pumped through the drill stem. The spoil is fine and relatively unsuitable for determining the soil structure.



## Hammer drilling

A hammer is lowered through the drill stem. The rock is pulverised by hammering and rotating motions produced by a compressed air motor. This method is commonly known as 'down the hole hammer'. It is used to drill holes in very hard formations. The yield is higher than with roller-bit drilling. The drilling depth is limited due to the use of compressed air.



## Our strengths

- Many years of experience with drilling
- An extensive pool of tools and equipment for all drilling methods and depths
- Numerous references inland and abroad
- Maintenance in our own shop
- Specific design in our own offices

